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OBSERVATIONS OF TROPICAL CLOUDS FROM THE UPGRADED MMCR AT DARWIN AND COMPARISONS WITH C-POL AND SATELLITE OBSERVATIONS

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ABSTRACT

The upgrade of the processor for the millimeter cloud radar (MMCR) at the TWP Darwin site in November 2005 offers a new and unprecedented view of tropical cloud systems. The new observations include higher temporal sampling (1.5 sec per mode), recording of Doppler spectra, and extended dynamic range without saturation. With this new information we are able to better define cloud boundaries, distinguish cloud-phase and estimate cloud and drizzle size distributions. We will compare the observations from the MMCR (frequency of occurrence, cloud type and boundaries, convective intensity) with those from the Bureau of Meteorological Research Center BMRC scanning C-band polarimetric radar (C-Pol) for several case studies. The BMRC C-Pol radar (Keenan et al. 1998) is located approximately 25 km to the northeast (12.252 S, 131.043 E) of the ARM surface remote sensing site at Darwin. The C-Pol radar is a scanning 5 cm wavelength radar which takes a complete volume scan every ten minutes. The transmitted signal alternates between vertical and horizontal polarization allowing the measurement of several different parameters in addition to the radar reflectivity. These parameters include the Doppler velocity, differential reflectivity, specific differential phase and the cross correlation. Each of these different polarization observations includes information related to the shape and phase of the scatterers and can therefore be used to identify different hydrometeor species. The BMRC uses a fuzzy logic approach to combine these polarization observations (Straka et al. 2000; Keenan 2003) to determine the hydrometeor species in the radar scan volume (May and Keenan 2003). This preliminary analysis compares MMCR, C-Pol and satellite observations of cloud boundaries, radar reflectivity, and hydrometeor phase for the column over the TWP-Darwin site and evaluates the potential and usefulness of scanning precipitation radars at the ARM sites